Geology

The Spokane Valley-Rathdrum Prairie Aquifer area contains richly varied and interesting geology. The geologic history of this area includes ancient mountain building, spectacular basalt lava flows, and some of the largest known glacial outburst floods. The map on the opposite page provides a visual description of the surface geology of the Aquifer area.

Throughout the Idaho Panhandle and the mountains around the Spokane Valley of Washington, the Belt Formations of Proterozoic sedimentary rocks dominate the geologic landscape. These rock formations were named after the Belt Mountains of central Montana, where they were first studied. The Belt Formations of Idaho and Washington consist mostly of mudstones and sandstones in somber shades of gray and brown, along with some pale gray limestone. Ripple marks are preserved in many of the mudstone and sandstone layers of the Belt Formation rocks, indicating these rocks were likely deposited in a shallow marine environment. Throughout northern Idaho the Belt Formations contain intruded layers (or sills) composed of diabase, a black igneous rock with the composition of ordinary basalt. These sills were formed as molten magma squirts between layers of sedimentary Belt rock forming a layer of igneous rock. The Precambrian Belt Formation also contains metal minerals (of silver, lead, and gold) in hydrothermal vein deposits, a valuable resource for the region. The placement of these valuable mineral deposits is associated with the mountain building continental plate collisions that created the Rocky Mountains.

Spokane and Coeur d'Alene are situated on the eastern edge of the Columbia Plateau. Many of the largest lava flows in the Columbia Plateau erupted about 135 miles southwest of the Aquifer. Extraordinarily fluid lava flows extended northward past the present location of Spokane and into Idaho. The remnants of these flows are found in and around the Spokane Valley. Basalt is a dense dark rock with very fine crystals, and it sometimes has a unique hexagonal (six-sided) column-like appearance. The Columbia basalts in the Spokane-Rathdrum valley were eroded prior to the formation of the Aquifer, and now only the western portion of the Aquifer lies on Columbia basalts.

This cross section of a local gravel pit illustrates the ice age flood episodes that deposited various layers of sands, gravels and cobbles, which presently comprise and contain the Aquifer water.

Geologic Time

Geologists use the geologic time scale to place events in geologic history. This time scale was developed through age dating and fossil correlation. Geologic time is organized into two "Eons" and numerous "Periods," as shown on the Geologic Unit key on this page. Three major geologic events define the creation of the Spokane Valley-Rathdrum Prairie Aquifer. The first event was the emplacement, metamorphism, and erosion of the Precambrian basement rock (Proterozoic Eon); the second event was the eruption of Tertiary (Miocene) flood basalts that created the Columbia Plateau; and, the third event was the glaciation in the Quaternary Period that first eroded, then filled the Spokane Valley-Rathdrum Prairie area with coarse sediments and gravel to create the Aquifer.

Recent Glaciation

Much of the geologic landscape we have inherited today in the northern Rocky Mountains was finally sculpted by processes related to glaciation. Four major glacial advances and recessions occurred in the last 1.6 million years of Earth history. The most recent of these Ice Age episodes climaxed about 15,000 years ago and ended about 10,000 years before present, leaving behind an eroded and modified landscape covered by various sedimentary deposits. Many of these relatively young and unconsolidated deposits cover the bedrock in the local area and show up on the Geologic Map on the adjacent page.

Large glaciers advanced as far south as Sandpoint in Idaho, and to near Deer Park in Washington. There is no evidence of glacial ice entering the Rathdrum Prairie or the Spokane Valley (see Back Cover) during the last Ice Age. The close proximity of these glaciers allowed sediments to be deposited that provide an important framework for the Aquifer we have today. Enormous outburst floods (see Ice Age Floods, page 10) were the primary agent for the distribution and deposition of coarse sands and gravels that eventually filled the Rathdrum Prairie and Spokane Valley. Also, blustery winds moving southward off of earlier glaciers picked up some of the finer-grained silt-sized sediments and distributed them across eastern Washington in the form of the rolling and fertile Palouse hills. In addition, the erosive action of the energetic glacial floods caused some steep slopes to be undermined, allowing large landslides to slip off of unsupported hill sides, particularly in the area north of Spokane.

Since the last Ice Age, subsequent on-going river erosion has caused the Spokane River to entrench into the glacial flood deposits and leave small terraces adjacent to the present day river course. A visit to the Spokane River in the valley shows the large boulders transported and deposited by the Ice Age floods, now exposed in the ancient benches along the modern stream.